

**SUPERFUND FINAL CLOSEOUT REPORT
HYDE PARK LANDFILL SUPERFUND SITE
TOWN OF NIAGARA
NIAGARA COUNTY, NEW YORK**

December 2007

Prepared by

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CITY OF NIAGARA FALLS
NIAGARA COUNTY, NEW YORK**

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NIAGARA COUNTY REFUSE SUPERFUND SITE
TOWN OF WHEATFIELD
NIAGARA COUNTY, NEW YORK**

I. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has determined that all appropriate response actions at the Hyde Park Landfill Superfund Site (Site) have been successfully implemented in accordance with *Close Out Procedures for National Priorities List Sites* (OSWER Directive 9320.2-09).

In accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act* (1980) (CERCLA) as amended, responsible parties and others have implemented all appropriate response actions selected in the Enforcement Decision Document (EDD - the equivalent of a Record of Decision) issued in November 1985.

II. SUMMARY OF SITE CONDITIONS

Site Background

The Hyde Park Landfill Site, approximately 15 acres in area, is located northwest of the City of Niagara Falls in the northwest corner of the Town of Niagara. The neighborhood surrounding the Site is mixed industrial and residential. The Niagara River, an international water body, is located 2000 feet to the northwest of the Site in the Niagara Gorge which descends approximately 350 feet below the surface of the landfill.

Hooker Chemical and Plastic Corporation, now Occidental Chemical Corporation (OCC), disposed of approximately 80,000 tons of chemical wastes at the Hyde Park Landfill from 1953 to 1975, primarily chlorobenzenes. Trichlorophenol (TCP) still bottoms were disposed of at the Site and approximately 0.7 - 1.6 tons of dioxin (2,3,7,8-Tetrachlorodibenzo-p-dioxin or TCDD) are believed to have been associated with these TCP wastes.

The geology underlying the site is glacial overburden overlying Lockport Dolomite, a fractured rock. The overburden is relatively impermeable and approximately 0 to 30 feet thick. Bloody Run Creek is a drainage channel that flows from the northwest corner of the landfill directly north, into storm sewers discharging to the Niagara Gorge and Niagara River. The bedrock is composed of various layers: beginning with the Lockport Dolomite, a fractured Karst formation (approximately 100 feet thick); followed by the Rochester Shale (60 feet thick); the Irondequoit/Reynales Limestone formation (Intermediate Formation); and, ending with the Queenston Shale (Deeper Formation).

The groundwater in the overburden moves toward the northwest and strongly downward into the bedrock. The groundwater in the bedrock moves downward and laterally, primarily in the northwest direction toward the Gorge Face, which acts as a natural drain. Some of the groundwater emerges from the bedrock at the Gorge Face in the form seeps which flow into the Niagara River.

Chemicals migrate from the landfill in two phases: (1) chemicals dissolved in the groundwater called aqueous phase leachate (APL) and (2) a denser than water phase like a viscous sludge in appearance which migrates under the influence of gravity called nonaqueous phase liquid (NAPL).

APL and NAPL migrate from the landfill, creating two separate contamination plumes in the overburden and the bedrock. The Bloody Run drainage area was contaminated as a result of infiltration of surface runoff while the landfill was still operating, and not from the movement of groundwater from the landfill.

EPA filed a lawsuit in 1979 under the authority of the Clean Water Act to require OCC to remediate the Site. EPA, NY State and OCC filed a Settlement Agreement in January 1981 which the Court approved in April 1982. The Settlement Agreement set forth the scope of the investigation OCC was to perform to characterize the nature and areal and vertical extent of the APL and NAPL plumes in both the overburden and the bedrock. OCC has been implementing the Settlement Agreement under government oversight since 1982. The Aquifer Survey (the equivalent of a remedial investigation) was conducted by Conestoga-Rovers & Associates (CRA) and completed in 1983. In 1985, after extensive negotiations, EPA, New York State and OCC agreed on the RRT Stipulation which decreed the remedies for the cleanup of the landfill. EPA issued an Enforcement Decision Document (EDD - the equivalent of a Record of Decision) in November 1985 selecting the following remedial actions:

- Source Control;
- Overburden Barrier Collection System;
- Bedrock NAPL Plume Containment System;
- APL Plume Containment System;
- Treatment and monitoring of collected leachates;
- Community Monitoring Program;
- Intermediate and Deep Formations Study;
- Industrial Protection Program; and,
- Niagara Gorge Seep Program.

Remedial Actions

OCC has been implementing the requirements of the EDD and RRT since 1986. In 1999, Miller Springs Remediation Management (MSRM) took over the implementation of the remedial action. MSRM is a subsidiary of, of Glenn Springs Holdings, Inc.(GSHI), which is in turn a subsidiary of OCC. The majority of the remedial action has been complete for several years at the Site.

Source Control

The source control remedial program consists of a five wells installed in the overburden inside the landfill. The purpose of the source control program is to reduce the contamination migrating downward from the landfill by removing mobile NAPL remaining in the landfill.

The RRT Stipulation proposed a phased approach to the installation of six source control wells in the landfill and required OCC to install two extraction wells and evaluate their performance prior to installing the additional four wells. OCC installed two 36-inch extraction wells in the landfill in 1990. Subsequent to an investigation including pump tests, OCC concluded that these large-diameter source-control wells did not collect as much NAPL as was expected by the design. The source control system was redesigned using the extraction well design OCC had successfully utilized at its Durez facility. OCC installed four 2-inch source control wells in the landfill with two-phase flow pumps to facilitate the pumping of NAPL. Nine monitoring wells were also installed in the landfill. One source-control was converted to a monitoring well because of insufficient NAPL collection.

The source-control wells are currently pumped once per month. NAPL extracted by the source-control wells flows into a decanter at the on-site Storage and Treatment Facility. The total recovered NAPL volume is measured monthly and the amount of NAPL contributed by each well is calculated annually by OCC. MSRM reports the amount of NAPL removed by the source control well in the *Hyde Park RRT Program Annual Monitoring Report*.

Overburden Barrier Collection System

The Overburden Barrier Collection System (OBCS) is a drain around the entire landfill designed to contain and collect APL and NAPL. The OBCS, consisting of eight well pairs installed beyond the alignment of a drain which already existed around the landfill, was constructed in 1991. One well from each pair is inside the APL plume limits and one well from each pair is outside the APL plume limits. The inner wells are pumped to create an inward hydraulic gradient. Hydraulic stabilization occurred in 1994, following one year of continuous dewatering by the OBCS (i.e., no accumulation of water in the wet wells). Hydraulic monitoring of the OBCS is performed by water-level measurements taken at the eight well pairs. Water-level measurements indicate that an inward gradient is being achieved, thereby capturing the contaminated groundwater associated with the Site. In addition, NAPL has not been observed in any of the overburden monitoring well locations, indicating that the OBCS serves as a barrier to off-site NAPL migration.

The OBCS was designed and installed by CRA under the oversight of EPA, NYSDEC and NYSDOH. The OBCS remedial design document, *Plans and Specifications for the Overburden Barrier Collection System*, was issued by OCC and CRA and approved by EPA and NYSED in October 1994. MSRM reports the results of the overburden monitoring in the *Hyde Park RRT Program Quarterly Monitoring Report* and the *Hyde Park RRT Program Annual Monitoring Report*.

Bedrock NAPL Plume Containment System

The NAPL Plume Containment System consists of wells in the bedrock designed to create an inward hydraulic gradient in the aquifer surrounding the landfill in order to capture groundwater contaminated by Site chemicals.

The RRT Stipulation required that an inward hydraulic gradient be demonstrated and maintained across the bedrock NAPL plume boundary. The bedrock aquifer was divided into three separate groundwater flow zones (Upper, Middle and Lower) and the Bedrock NAPL Plume Containment System was designed and installed in a phased approach in order to achieve proper placement of the extraction wells within these flow zones.

Phased-Approach Well Installation

The first set of wells were installed, pump tested and connected by force mains to the on-site treatment facility. The capture zones of the wells were evaluated, and based on the results of the evaluation, additional wells were installed in areas where capture was not being attained. The remedial design document, *Plans, Specifications and Protocols • Well Installation Program*, was issued by OCC and CRA and approved by EPA and NYSDEC in October 1989.

Phase I, consisting of six purge wells, was installed for OCC by CRA in 1990 under the oversight of EPA, NYSDEC and NYSDOH. Two well nests of three wells each were installed in the upper, middle and lower units of bedrock. OCC conducted pump tests on individual and multiple wells throughout 1991. OCC submitted to EPA and New York State a Phase I pump test report in February 1993. EPA and New York State approved OCC's recommendation for the location of Phase II purge and recirculation wells and required OCC to install two additional wells. The installation of the Phase II wells was completed in 1993. OCC conducted pump tests on the Phase II wells which were completed in 1994. The results of these pump tests indicated that further hydraulic control was necessary. Additional wells were installed and a network of eleven bedrock purge wells was operational in 1997.

Groundwater Modeling Study

OCC operated this network of eleven wells but could not demonstrate an inward hydraulic gradient across the NAPL plume boundary. The Site is located in a very complex hydrogeologic setting and there existed uncertainties with respect to groundwater flow. In 2000, MSRM contracted S. S. Papadopulos & Associates, Inc. (SSPA) to perform a detailed groundwater modeling study of the Site. The model was used to evaluate the performance of the existing bedrock remedial pumping system. Particle tracking was utilized to determine the capture zones of the existing bedrock wells. The model indicated that there was a vertical component of flow (i.e., some of the water from the Upper zone was being captured in the Lower zone).

Installation of Additional Wells in 2001

MSRM used the results of the model to select the locations of six additional wells which were installed in 2001. EPA and NYSDEC approved the locations of these wells. MSRM, EPA and NYSDEC evaluated the complex water-level data to determine if an inward hydraulic gradient was being achieved by the current set of eighteen extraction wells. The analysis of the water-level data led MSRM to determine that the system of Upper, Middle and Lower monitoring that utilized wells with long screening intervals, which were open over several flow zones, could not measure the groundwater capture at the Site with accuracy.

Site Re-Characterization

Subsequent to the development of the ground-water model, MSRM revised the Site conceptual model which provided the basis for the numerical simulation of the hydrogeologic system. MSRM conducted field investigations from 2001 to 2003, including down-borehole geophysics, water-level measurements in 113 piezometers. The analysis of the field data resulted in a revised hydrogeologic framework consisting of eleven discrete flow zones separated by aquitards. MSRM has documented its revised hydrogeologic framework in two documents: *Site Characterization Report: Revised Geologic and Hydrogeologic Characterization* (February 2002) and *Site Characterization Report: Hydrologic Characterization* (February 2003). This report, dated February 2003, was produced for MSRM by Services Environmental, Inc. (SEI), SSPA and CRA.

The eleven flow zones replace the Upper, Middle and Lower Bedrock framework formerly used at this Site. Groundwater monitoring has been conducted in the eleven flow zones since late 2002.

After the geology at the Site was re-characterized, MSRM produced a new ground-water model which assists in determining if the groundwater remedy provides capture of the contaminated water associated with the Site. *Site Characterization Report: Groundwater Flow Model*, dated June 2003, was prepared for MSRM by SSPA. The results of the groundwater model indicate that capture of contaminated groundwater is achieved in the bedrock.

Hydraulic Capture Demonstrated

MSRM issued the *Site Characterization Report: Remedial Characterization Report (RCR)*, prepared by SEI, SSPA and CRA in June 2003. The RCR concludes that the Bedrock NAPL Plume Containment System satisfies the performance objectives of the RRT (inward gradient). Although the data for two of the flow zones suggest some uncertainty in the inward gradient, chemical analyses of the groundwater from these two zones indicate that Site-related contaminants are not present in this groundwater. This indicates that no migration of contaminants outside of the containment system is occurring. EPA and NYSDEC concurred with that the bedrock remedy satisfies the performance objectives of the RRT.

Bedrock APL Plume Containment System

The APL Plume Containment System, consisting of three purge wells installed at the Niagara Gorge Face, was designed to collect a significant portion (60-88%) of the contaminated groundwater outside the NAPL plume (as required by the RRT). These wells were designed by CRA under the oversight of EPA and NYSDEC and installed in 1994. The portion of the APL plume not collected is monitored by 3 flux monitoring well clusters to the west of the Site and 3 piezometer clusters in the northern and eastern portion of the APL plume.

The RRT established APL Plume Flux Action Levels based on EPA's worst-case bioaccumulation assumptions for the following chemicals: TCDD (0.5 grams/year); perchloropentacyclodecane [Mirex] (0.005 lbs/day); Aroclor 1248 (0.005 lbs/day); and, chloroform (1.7 lbs/day). These action levels represent concentrations of these contaminants that, if detected entering the river (flux of contaminants to the river) at or above these concentrations, would require OCC to take additional remedial actions (*e.g.* increased pumping, installing additional wells or other remedial measures) to reduce these contaminant levels. The only parameter detected in 2001 was TCDD. OCC calculated the flux of TCDD to the Niagara River as 7.06×10^{-5} grams/year, which is several orders of magnitude below the Flux Action Level.

Treatment and Monitoring of Collected Leachates

Hyde Park Landfill Leachate Storage and Treatment Facility

APL is treated on-site at the Leachate Storage and Treatment Facility constructed by OCC which began operating in April 1990. This facility, capable of treating 400 gallons per minute, operates the facility according to the *Hyde Park Collection and Aqueous Phase Leachate (APL) Treatment System Operation and Maintenance Manual*, MSRM, March 2007.

The APL/NAPL mixture is pumped from the wells through force mains into a decant tank. The NAPL, denser than water, settles to the bottom. APL is taken off the top of the decanter and pumped into the storage tanks. The APL first passes through sacrificial activated carbon beds (which cannot be recycled because of the dioxin and are disposed of offsite). The APL is then treated in an activated carbon system. More than 30,000,000 gallons were treated in 2006.

NAPL Treatment

OCC transfers NAPL by trucks to Laidlaw Environmental Services in Deer Park, Texas, for incineration. To date, more than 300,000 gallons of NAPL have been removed from the site and destroyed. Approximately 800 gallons of NAPL were collected and incinerated in 2006.

Landfill Cap

The Settlement Agreement required OCC to cap the landfill with 36 inches of clay, with a 12-inch vegetative cover. Before a final cap could be placed on the landfill, wastes associated with remedial activities had to be managed. OCC developed the Waste Disposal Plan, which was implemented in 1988. Waste disposal cells lined with clay were constructed on top of the landfill to consolidate wastes resulting from remedial actions and investigations conducted at the Site. Contaminated soils from investigative activities and sediment from the Bloody Run remediation were consolidated in the landfill. The perimeter cap of the landfill was completed in 1991, and the entire landfill cap was completed in 1994. The final cap consisted of the following: low-permeability clay; a synthetic membrane; a drainage layer and topsoil seeded with native vegetation for barrier protection. EPA routinely inspects the landfill cap for erosion. The current condition of the cap is excellent.

The remedial design document *Project Specification for Final Landfill Cap* was issued by OCC in June 1994 and reviewed and approved by EPA and NYSDEC. The landfill cap was designed and installed by CRA under the oversight of EPA, NYSDEC and NYSDOH.

Community Monitoring Program

The Community Monitoring Wells, a system of wells installed in 1987 throughout the neighborhood, provide early warning of the presence of Hyde Park contaminants in the groundwater. These wells are sampled and analyzed quarterly. Should contamination be detected, OCC must take further remedial action. Hyde Park contaminants have never been detected in these wells. The data collected have demonstrated that the groundwater flow is vertically downward in the nearby community. EPA and New York State review the analytical results from sampling of these wells to ensure the community is being protected.

Industrial Protection Program

The Industrial Protection Program, implemented in 1987, established engineering controls to eliminate the exposure of nearby workers to contaminants present in the NAPL and APL plumes. Sumps and manholes in neighboring industries, including Grief Brothers (located directly down-gradient from the landfill), were sealed, eliminating worker exposure to vapors that may migrate into the sump. OCC relocated a sewer at neighboring Tams Ceramics in 1989. The College Heights sewer was remediated in 1990.

OCC purchased the Grief Brothers building and future access to this facility is now controlled by OCC. Periodic surveys of neighborhood manholes and sumps are performed to ensure the remedies remain intact.

Bloody Run Remediation

The Bloody Run received drainage from the landfill prior to any remedial measures. Residents living alongside contracted chloroacne, a skin disease, from exposure to the contaminated water. OCC relocated several families who lived next to this stream.

The Settlement Agreement set forth two possibilities for remedial action at the Bloody Run, sediment excavation or capping. In 1992, EPA performed a risk assessment that determined the excavation of sediments in the Bloody Run would not pose an adverse risk would be protective of human health, and was the preferred alternative.

CRA excavated approximately thirty thousand cubic yards of contaminated sediment from the Bloody Run drainage area. The area was then backfilled and covered with riprap. This work was completed in January 1993. The Bloody Run now flows via a storm sewer which surfaces at the Niagara Gorge. The restored area was observed to have abundant vegetation during Site visits during 2000-2003. Monitoring wells located in this area demonstrate that there is no Site-related contamination remaining.

Niagara River Gorge Face Remediation

Groundwater seeps from the rock at the Niagara Gorge, approximately 2000 feet from the Site. TCDD was detected in one sample from a seep during remedial investigations at 0.2 ppt. EPA and New York State determined that humans should be isolated from the seeps to prevent an exposure pathway to the contaminants. The Gorge Face Seeps were remediated in 1988, except for the Bloody Run portion, which was remediated in 1994. Access by humans to the seeps has been prevented by the installation of fences and the diversion of seeps into culverts. All contaminated sediments were scraped away. Annual inspections of the Gorge Face are conducted by representatives of EPA, New York State and OCC. The pumping of the APL wells has strongly influenced the seeps, drying many.

A rock slide occurred in 1994 on the lower slopes of the Bloody Run, below the New York Power Authority road. Globules of NAPL were exposed on some rocks. These rocks were removed and the remaining rocks were covered with native rocks. Residual NAPL remains hidden in this slope.

Gorge Face Seep inspections are conducted every summer by OCC, CRA, NYSDEC, NYSDOH and Earthtech representing EPA. These inspections are documented in the *Annual Gorge Seep Survey* issued by MSRM.

Intermediate and Deep Bedrock Formations Study

The Intermediate and Deep Formations Study was designed to determine if contaminants from the Hyde Park Landfill had penetrated the Rochester Shale (aquitar) formation below the Lockport Dolomite. If action levels documented in the RRT are exceeded in the Intermediate Formations, then monitoring wells will be installed in the Deep Formations. In addition, a total flux to the

Niagara River is calculated, and if the Flux Action Levels are exceeded, further remedies would be required to reduce the loading to the river.

Monitoring wells were installed by OCC and CRA in the intermediate formations in 1990 without detecting the presence of NAPL. Most wells contained insufficient volumes of groundwater for sample collection after purging activities, indicating that the shale is a good aquitard. The *Monitoring Report, Intermediate Formations Wells, November 1991/1992*, prepared by OCC and CRA, summarizes the results of the investigation. Most of the parameters were not detected above the concentrations of Lower Formation Survey Parameters listed in the RRT Stipulation. However, phenol, total organic halogen, PCB-1248 and conductivity did exceed the survey levels. OCC calculated a flux in the monitoring report which was four to five orders of magnitude below the Flux Action Level.

OCC was not required to install monitoring wells in the Deep Formations because the Intermediate Formations' investigation indicated that Hyde Park contaminants had not migrated through the shale and were not present in the Intermediate Formations.

Additional Remedial Actions

OCC has performed additional remedial actions at the Site in addition to those previously discussed. The on-site lagoons were remediated in 1991. NAPL in the lagoons was pumped into the leachate storage facility and the lagoons were closed. NAPL was also pumped from four railroad tank cars, which had been used on-site for years as storage for NAPL generated from remedial investigations because there was no facility permitted to destroy dioxin. In 1991, the tank cars were placed in the waste disposal cells.

OCC also remediated sewers in the area. Sewers provided preferential pathways for contaminants to migrate through the overburden. As previously mentioned, OCC relocated a sewer at TAM Ceramics and remediated the College Heights sewer. The remediation of the University Drive (bordering Niagara University) sewer was completed in August 1993. NAPL contaminated soils were removed from under University Avenue; these soils were placed in a waste disposal cell at the landfill, prior to installing the final cap.

Institutional Controls

The 1985 EDD did not require institutional controls. Access to the site is restricted and there is a fence around the site with an alarm system. There are no drinking-water wells located within the plume area. No new wells are expected as a Niagara County ordinance prohibits the installation of drinking-water wells without a permit. The entire Site property, owned by OCC, is zoned industrial by the Town of Niagara. Further, the Site was listed with the Niagara County Industrial Development Agency and Registry of Inactive Hazardous Waste Disposal Sites in New York State.

Community Relations Activities Performed

EPA maintained a Public Information Office (PIO) in Niagara Falls, New York operated by Ecology and Environment, Inc from 1985 through 2005. The PIO was then moved to Buffalo, New York. Site files are available in the PIO for public review. Public meetings were held at Niagara University during the RRT negotiations and during the early stages of remedial action. EPA has held public availability sessions at the Niagara Falls PIO where the project manager meets with interested members of the public and discuss Site conditions in an informal setting. The PIO maintains a Site mailing list. Periodically, fact sheets and Site updates are mailed to this list.

III. DEMONSTRATION OF QUALITY ASSURANCE/QUALITY CONTROL

The Quality Assurance/Quality Control program used throughout the performance of the various Remedial Actions was rigorous and in conformance with EPA and DEC standards; therefore, the EPA and the DEC determined that all analytical results are accurate to the degree needed to assure satisfactory execution of the Remedial Actions, consistent with CERCLA, the 1985 EDD, and all Remedial Design plans and specifications.

IV. SUMMARY OF OPERATION AND MAINTENANCE

OCC conducts extensive O&M at the Site pursuant to the latest revision of the *Hyde Park Collection and Aqueous Phase Leachate (APL) Treatment System Operation and Maintenance Manual*, March 2007.

APL and NAPL are separated in decant tanks. The APL is treated onsite and the NAPL is sent offsite for incineration.

The carbon beds at the Treatment Facility are routinely changed and regenerated. The sacrificial carbon beds are routinely changed and disposed. OCC conducts influent and effluent analyses to ensure compliance with the discharge permit.

Quarterly sampling is performed. Hydraulic and chemical data are collected and analyzed. These results are documented in a Quarterly Report.

OCC must perform extensive well and pump maintenance, as NAPL often fouls wells and pumps.

OCC performs an annual Gorge Face Seep Survey to ascertain that the remedial actions taken in the Gorge remain protective of human health and the environment.

MONITORING RESULTS

MSRM evaluates the performance of the remedial systems using “multiple lines of evidence.” MSRM evaluates the groundwater flow directions from the potentiometric surface maps. Flow directions are estimated for vertical gradients since there is a significant amount of downward vertical flow. MSRM evaluates the distribution of Site-related parameters in groundwater. MSRM evaluates the distribution of major ions and the relative age of the groundwater near the gorge to ensure that this groundwater is not related to the Site. In addition, MSRM performs groundwater modeling.

Quarterly sampling and monitoring began in 1993. MSRM issues quarterly and annual reports. Monitoring results indicate that the remedial system as designed and constructed pursuant to the 1985 EDD is performing satisfactorily.

V. SUMMARY OF REMEDIATION COSTS

Construction costs were not required to be submitted by the PRPs under the Consent Decree. The construction cost estimate from the design reports was \$65 million. Annual operation and maintenance costs were also not required to be submitted and are estimated to be \$2 million.

VII. PROTECTIVENESS

The Site meets all the site-completion requirements as specified in OSWER Directive 9320.2-09, *Close Out Procedures for National Priorities List Sites*. Specifically, all cleanup actions specified in the ROD have been implemented. Since the leachate pumping system became operational, the Site no longer poses any threats to human health and the environment. The only continuing effort at the Site is the ongoing O&M activity. A bibliography of all reports relevant to the completion of the Site under the Superfund program is attached.

VIII. FIVE YEAR REVIEW

Hazardous substances, pollutants, or contaminants remain at the Site. In accordance with CERCLA Section 121(c), the remedies at the Site will be reviewed no less often than every five years. The previous Five-Year Review was conducted in September 2006. Therefore, the next Five-Year Review will be conducted in September 2011.

Approved by:

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Date

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